Journal of Information Security and Applications 59 (2021) 102846

Contents lists available at ScienceDirect

Journal of Information Security and Applications

journal homepage: www.elsevier.com/locate/jisa

Development of payload capacity enhanced robust video watermarking scheme based on symmetry of circle using lifting wavelet transform and SURF

Himanshu Agarwal [a,*], Farooq Husain [b]

[a] Department of Computer Science and Engineering, Moradabad Institute of Technology, Moradabad (U.P.) - India
[b] Director, Shivadan Singh Institute of Technology and Management, Aligarh (U.P.) - India

ARTICLE INFO

Keywords:
LWT
SURF
Symmetry of circle
Color video watermarking

ABSTRACT

Using simple image and video editing software it is relatively easy to pirate the digital contents at the cost of huge revenue loss to the content owner. Entertainment is the key industry that is overwhelmed by huge financial loss due to digital piracy. WhatsApp, Facebook, Instagram, Pinterest and Twitter are some of the massive social media platforms that are used by millions of users. Many of the users share digital content without giving credit to the owner. Digital watermarking is an efficient technique to protect the digital rights and legal compensation of content owners. Due to the poor selection of watermarking locations, most of the state-of-art methods were fall short to preserve the relationships among the host data. Hence such methods were not efficient to provide safeguards against digital piracy. Therefore, this paper proposes a digital video watermarking technique that analyzes, extracts and processes the useful patterns or features of data based on the symmetry of the circle using 2D-Lifting Wavelet Transform (2D-LWT) and Speeded-Up Robust Features (SURF). SURF method is used to obtain five invariant feature points on an approximation part of 2D-LWT utilizing the luminance component of each video frame. The invariant points serve as centers of the circles used to find the embed locations. The maximum intensity value point in all the points on the circumference of the 1/8 part of the circle is then calculated to serve as an embedding location. Three other points in different quadrants are simply obtained using the concept of symmetry of the circle. After applying temporal desynchronization, compression and insertion of noise attacks the video is assessed through subjective and objective evaluation metrics. The results reveal a high degree of correlation (close to one) and good visual transparency which proves that the proposed scheme is superior for practical applications.

1. Introduction

Due to the massive use of multimedia content for online teaching, entertaining persons using social media platforms, distribution of popular television shows and movies over the internet without taking permission or giving proper credit to the owner causes a huge loss of revenue to the owners of these multimedia contents. Illegal recording, modification, reproduction, distribution of digital multimedia contents comes under the category of digital piracy and it is considered as a crime under the law for which a person can be imprisoned and fined. To protect the ownership rights of the creator, digital watermarking has been used as a valuable technique against the adversary for the last two decades. Digital watermarking is one of the most promising techniques for embedding some information such as a logo or a pattern called a watermark in the digital contents in such a way that it can be extracted from it later to protect the owner's identity against unauthorized manipulation and distribution and to sue in the court.

Many digital watermarking mechanisms have been proposed by authors mentioned in the survey papers [1,2]. Based on the mechanism involved to insert this extra information (watermark) in the digital contents, there are two categories of digital watermarking techniques: spatial domain techniques [3,4] and transform domain techniques [5]. In spatial domain techniques, unauthorized processing of digital contents is protected by altering the spatial pixel values directly. Replacing the least significant bit with the watermark pattern is the most common method employed by spatial domain techniques [6]. The complexity of

* Corresponding author.
E-mail address: himanshu.agg2000@gmail.com (H. Agarwal).

https://doi.org/10.1016/j.jisa.2021.102846

Available online 30 April 2021